

What Is Claimed Is:

1. A method of detecting a composition of an audience of an information presenting device comprising:
 - capturing at least one image of the audience;
 - determining a number of people within the at least one image; and
 - prompting the audience to identify its members if a change in the number of people is detected based on the number of people determined to be within the at least one image.
2. A method as defined in claim 1 wherein capturing the at least one image of the audience comprises digitizing the at least one image.
3. A method as defined in claim 1 wherein determining the number of people within the at least one image comprises:
 - (a) determining at least one difference image based on at least two captured images;
 - (b) developing at least one shape from the at least one difference image;
 - (c) identifying at least one center of the at least one shape;
 - (d) adding a symbol having a predetermined size and indicative of the at least one center of the at least one shape to a histogram;
 - (e) repeating (a)-(d); and
 - (f) if any symbol in the histogram grows beyond a predetermined

threshold, counting that symbol as a person.

4. A method as defined in claim 3 wherein determining the at least one difference image based on the at least two of the captured images comprises:

- (a) determining a first difference image between a first image and a second image; and
- (b) determining a second difference image between the second image and a third image.

5. A method as defined in claim 4 further comprising developing an amalgamated image from the first and second difference images.

6. A method as defined in claim 5 wherein developing the at least one shape from the at least one difference image comprises developing the at least one shape from the amalgamated image.

7. A method as defined in claim 3 wherein identifying the at least one center of the at least one shape comprises identifying a center of a first shape and a center of a second shape.

8. A method as defined in claim 7 wherein adding the symbol having the predetermined size and indicative of the at least one center of the at least one shape to the histogram comprises adding a first symbol

indicative of the center of the first shape to the histogram and adding a second symbol indicative of the center of the second shape to the histogram.

9. A method as defined in claim 8 wherein repeating (a)-(d) comprises stacking a third symbol on the first symbol if a second difference image contains a shape having a center that substantially corresponds to the center of the first shape.

10. A method as defined in claim 3 further comprising excluding a shape from a group of possible human shapes based on a test.

11. A method as defined in claim 10 wherein the test comprises at least one of a location test and a size test.

12. A method as defined in claim 3 further comprising identifying an energy value associated with the at least one difference image, and, performing (f) if the energy value exceeds a predetermined threshold.

13. A method as defined in claim 3 wherein developing the at least one shape from the at least one difference image comprises executing a convex hull process.

14. A method as defined in claim 3 wherein, if any symbol in the histogram does not grow within a predetermined length of time, that symbol is eliminated from the histogram.

15. A method as defined in claim 1 further comprising:
if a number of members identified by the audience is different from the determined number of people after a predetermined number of prompts of the audience, adjusting a value to avoid excessive prompting of the audience.

16. A method as defined in claim 15 wherein adjusting the value comprises increasing a previous audience count by a difference between the number of members identified by the audience and the number of people determined from the at least one image.

17. A method as defined in claim 16 further comprising recording the difference between the number of members identified by the audience and the number of people determined from the at least one image as a number of unidentified audience members.

18. A method as defined in claim 1 further comprising periodically exporting recorded data to a device to identify audiences and programs being consumed by the audiences.

19. A method as defined in claim 1 further comprising identifying a program being consumed by the audience.

20. A method as defined in claim 19 wherein identifying a program being consumed by the audience further comprises:

identifying a consumption time; and

identifying a source of the program being consumed by the audience.

21. A method as defined in claim 20 further comprising recording the source and the consumption time.

22. A method as defined in claim 20 wherein identifying the source of the program comprises identifying a tuned channel.

23. A method as defined in claim 20 further comprising using the consumption time and the source to identify the program from a program guide.

24. An apparatus to detect a composition of an audience of an information presenting device comprising:

a camera to capture at least one image of the audience;

a processor;

a memory storing computer readable instructions which, when executed, cause the processor to:

determine a number of people within the at least one image;
and
develop a prompt signal requesting the audience to identify its members if a change in the number of people is visually detected; and
an output device responsive to the prompt signal to output an indication requesting the audience to identify its members.

25. An apparatus as defined in claim 24 wherein the output device is a visual display and the prompt signal is a visual signal.

26. An apparatus as defined in claim 24 wherein the camera digitizes the at least one image.

27. An apparatus as defined in claim 24 wherein the processor determines the number of people within the at least one image by:

- (a) determining at least one difference image between at least two images captured by the camera;
- (b) developing at least one shape from the at least one difference image;
- (c) identifying at least one center of the at least one shape;
- (d) adding a symbol having a predetermined size and indicative of the at least one center of the at least one shape to a histogram;
- (e) repeating (a)-(d); and
- (f) if any symbol in the histogram grows beyond a predetermined

threshold, counting the symbol as a person.

28. An apparatus as defined in claim 24 wherein, if a number of members identified by the audience is different from the determined number of people after a predetermined number of prompts of the audience, the computer readable instructions cause the processor to adjust a value to avoid excessive prompting of the audience.

29. An apparatus as defined in claim 28 wherein the processor adjusts the value by increasing a previous audience count by a difference between the number of members identified by the audience and the number of people determined from the at least one image.

30. An apparatus as defined in claim 29 wherein the computer readable instructions cause the processor to record the difference between the number of members identified by the audience and the number of people determined from the at least one image as a number of unidentified audience members.

31. An apparatus as defined in claim 24 wherein the computer readable instructions cause the processor to periodically export recorded data to a device to identify audiences and programs being consumed by the audiences.

32. An apparatus as defined in claim 24 wherein the computer readable instructions cause the processor to identify the program being consumed by the audience.
33. An apparatus as defined in claim 32 wherein identifying a program being consumed by the audience further comprises:
- identifying a consumption time; and
 - identifying a source of the program being consumed by the audience.
34. An apparatus as defined in claim 33 wherein the computer readable instructions cause the processor to record the source and the consumption time.
35. An apparatus as defined in claim 33 wherein identifying the source of the program further comprises identifying a tuned channel.
36. An apparatus as defined in claim 33 further comprising using the consumption time and the source to identify the program from a program guide.
37. A machine readable medium storing machine readable instructions which, when executed, cause at least one machine to:
- capture at least one image of an audience consuming a program;
 - determine a number of people within the at least one image; and

output a prompt signal requesting the audience to identify its members if a change in the number of people is detected from the at least one image.

38. A machine readable medium as defined in claim 37 wherein the at least one machine determines the number of people within the at least one image by:

- (a) determining at least one difference image between at least two captured images;
- (b) developing at least one shape from the at least one difference image;
- (c) identifying at least one center of the at least one shape;
- (d) adding a symbol having a predetermined size and indicative of the at least one center of the at least one shape to a histogram;
- (e) repeating (a)-(d); and
- (f) if any symbol in the histogram grows beyond a predetermined threshold, counting the symbol as a person.

39. A machine readable medium as defined in claim 37 wherein, if a number of members identified by the audience is different from the determined number of people after a predetermined number of prompts of the audience, the machine readable instructions cause the at least one machine to adjust a value to avoid excessive prompting of the audience.

40. A machine readable medium as defined in claim 39 wherein the at least one machine adjusts the value by increasing a previous audience count by a difference between the number of members identified by the audience and the number of people determined from the at least one image.

41. A machine readable medium as defined in claim 40 wherein the machine readable instructions cause the at least one machine to record the difference between the number of members identified by the audience and the number of people determined from the at least one image as a number of unidentified audience members.

42. A machine readable medium as defined in claim 37 wherein the machine readable instructions cause the at least one machine to periodically export recorded data to a device to identify audiences and programs being consumed by the audiences.

43. A machine readable medium as defined in claim 37 wherein the machine readable instructions cause the at least one machine to identify the program being consumed by the audience.

44. A machine readable medium as defined in claim 43 wherein identifying a program being consumed by the audience further comprises:
identifying a consumption time; and

identifying a source of the program being consumed by the audience.

45. A machine readable medium as defined in claim 44 wherein the machine readable instructions cause the at least one machine to record the source and the consumption time.

46. A machine readable medium as defined in claim 44 wherein identifying the source of the program comprises identifying a tuned channel.

47. A computer readable medium as defined in claim 44 further comprising using the consumption time and the source to identify the program from a program guide.

48. An apparatus to detect a composition of an audience of an information presenting device comprising:

- an image sensor to capture at least one image of the audience;
- a people counter to determine a number of people in the at least one image;
- a change detector to compare the number of people in the at least one image to a value representative of a previous number of people in the audience;
- a prompter to request the audience to identify its members if the change detector identifies a difference between the number of people in the

at least one image and the value representative of the previous number of people in the audience; and
an input device to receive data from the audience.

49. An apparatus as defined in claim 48 further comprising a compliance detector to determine if a member of the audience is not being identified in response to the prompt.

50. An apparatus as defined in claim 48 wherein the prompter is a visual display.

51. An apparatus as defined in claim 48 wherein the image sensor is a digital camera.

52. An apparatus as defined in claim 48 further comprising a digitizer to digitize the image captured by the image sensor.

53. An apparatus as defined in claim 48 wherein the people counter comprises:

a motion detector to compare at least two images to detect motion;
an image amalgamator to develop an amalgamated image from the at least two images;
a shape outliner to draw at least one shape within the amalgamated image; and

a blob discriminator to determine if the at least one shape represents a person.

54. An apparatus as defined in claim 53 further comprising a non-human filter to eliminate a non-human shape from the at least one shape.

55. An apparatus as defined in claim 54 wherein the non-human filter eliminates the non-human shape based on at least one of a location of the non-human shape and a size of the non-human shape.

56. An apparatus as defined in claim 53 wherein the blob discriminator comprises:

- a center locator to identify a center of the at least one shape;
- a center comparator to add a symbol representative of the center of the at least one shape to a histogram; and
- a threshold counter to count symbols in the histogram exceeding a predetermined threshold.

57. An apparatus as defined in claim 56 wherein if the center of the at least one shape substantially corresponds to an existing center in the histogram, the center comparator adds the symbol representative of the center of the at least one shape to a symbol representing the existing center in the histogram.

58. An apparatus as defined in claim 56 further comprising an energy detector to compare a value indicative of motion occurring between the two images to an energy threshold, and to cause the threshold counter to count the symbols in the histogram exceeding the predetermined threshold if the value exceeds the energy threshold.

59. An apparatus as defined in claim 56 further comprising a false motion detector to eliminate a non-growing symbol from the histogram.

60. An apparatus as defined in claim 48 wherein, if a number of members identified by the audience is different from the number of people determined by the change detector after a predetermined number of prompts of the audience, a compliance detector adjusts the value representative of the previous number of people in the audience to avoid excessive prompting of the audience.

61. An apparatus as defined in claim 60 wherein the compliance detector adjusts the value by increasing the value representative of the previous number of people in the audience by a difference between the number of members identified by the audience and the number of people determined from the image by the people counter.

62. An apparatus as defined in claim 61 wherein the compliance detector records the difference between the number of members identified

by the audience and the number of people determined from the at least one image as a number of unidentified audience member.

63. An apparatus as defined in claim 48 further comprising a content collector to identify the program being consumed by the audience.

64. An apparatus as defined in claim 48 further comprising an output device to export recorded data to a device to identify audiences and programs being consumed by the audiences.

65. An apparatus as defined in claim 63 wherein the content collector further comprises a program detector to identify a source of the program being consumed by the audience.

66. An apparatus as defined in claim 65 further comprising a time stamper to identify a consumption time, and a memory to record the source and the consumption time.

67. An apparatus as defined in claim 65 wherein the program detector identifies the source of the program by identifying a tuned channel.